Health Hazards and Nitrous Oxide A Time for Reappraisal.

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Recent adoption by the American Conference of Governmental Industrial Hygienists of a Threshold Limit Value of 50 ppm for an 8-hour average exposure to nitrous oxide (N_2O) increases the likelihood for its regulation by state and federal occupational health agencies. This review outlines current information on the health risks of N_2O inhalation to provide a basis from which safe and reasonably attainable exposure limits can be proposed. Although N_2O was for many years believed to have no toxicity other than that associated with its anesthetic action, bone marrow depression in patients administered N_2O for extended periods of time and neurological abnormalities in health care workers who inhaled N_2O recreationally have disproved this notion. Retrospective surveys of dental and medical personnel have also linked occupational exposure to N_2O with a number of health problems and reproductive derangements. Nitrous oxide reacts with the reduced form of vitamin B_{12}, thereby inhibiting the action of methionine synthase, an enzyme that indirectly supports methylation reactions and nucleic acid synthesis. Many, if not all, of the nonanesthetic-related adverse effects of N_2O may be ascribed to this action. Animal and human studies indicate that the toxic effects of N_2O are concentration- and time-dependent. It is suggested that a time-weighted average of 100 ppm for an 8-hour workday and/or a time-weighted average of 400 ppm per anesthetic administration would provide adequate protection of dental personnel and be achievable with existing pollution control methods.